



TES H₂O comparisons with aircraft, AIRS and sondes

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September 2006



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TES H₂O retrievals

- This is a status report on TES v002 water vapor, the version available at the DAAC.
- TES error bars shown are the observational errors (random plus cross-state errors).
- TES H₂O retrievals shown here have been selected for retrieval quality flag = 1.



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TES H₂O Comparisons with AIRS

A. Eldering and the TES team



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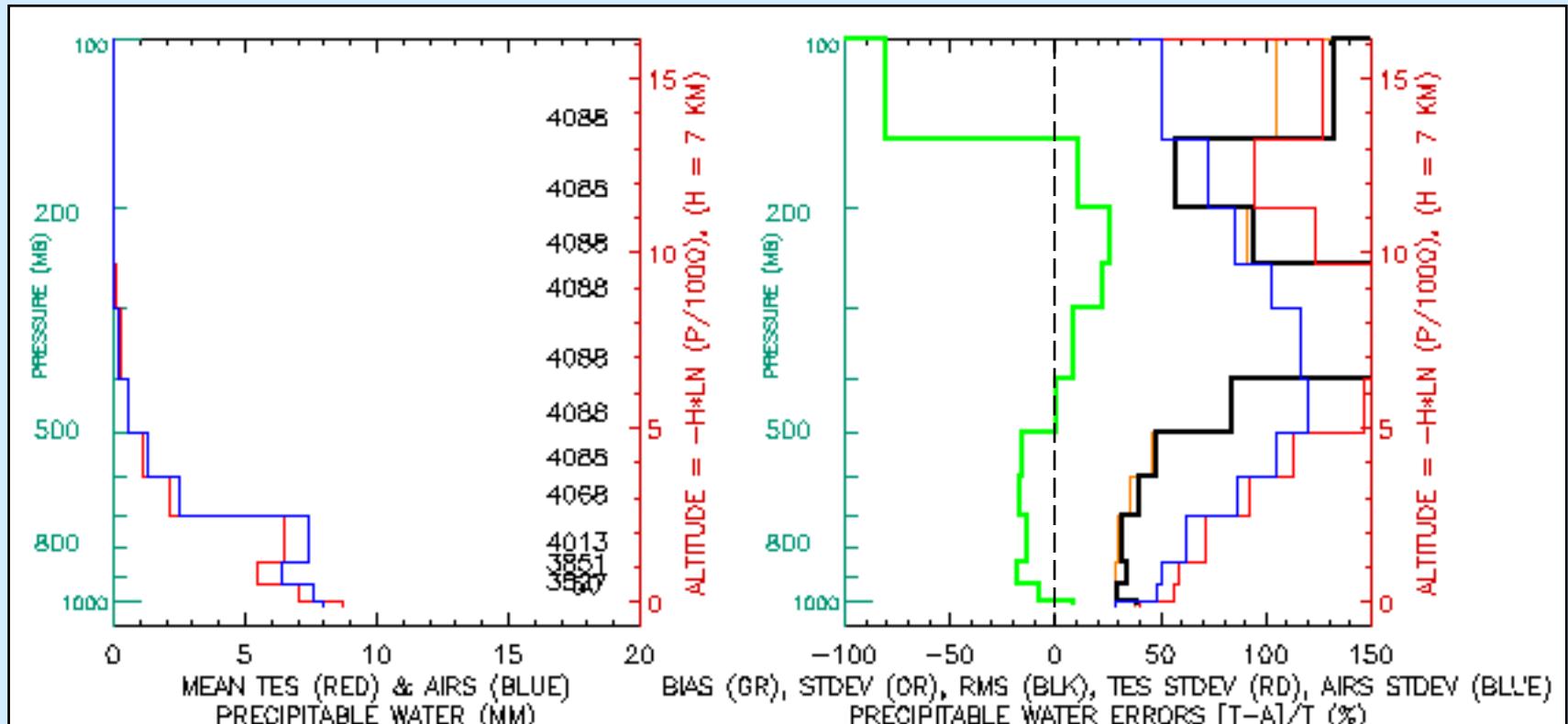
The data sets and approach

- TES data
 - 8x5 km footprint.
 - Used recommended data quality screening (retrieval quality flag).
 - V002
 - Global surveys only
- AIRS data
 - Closest match to TES, but note that retrievals are on 45-km diameter footprint.
 - Used only QA_TEMP_BOT = 0 quality flag.
 - v4.0

Matched closest AIRS to TES observations,
interpolated TES data to AIRS retrieval levels



TES vs AIRS



Mean profiles

TES - AIRS



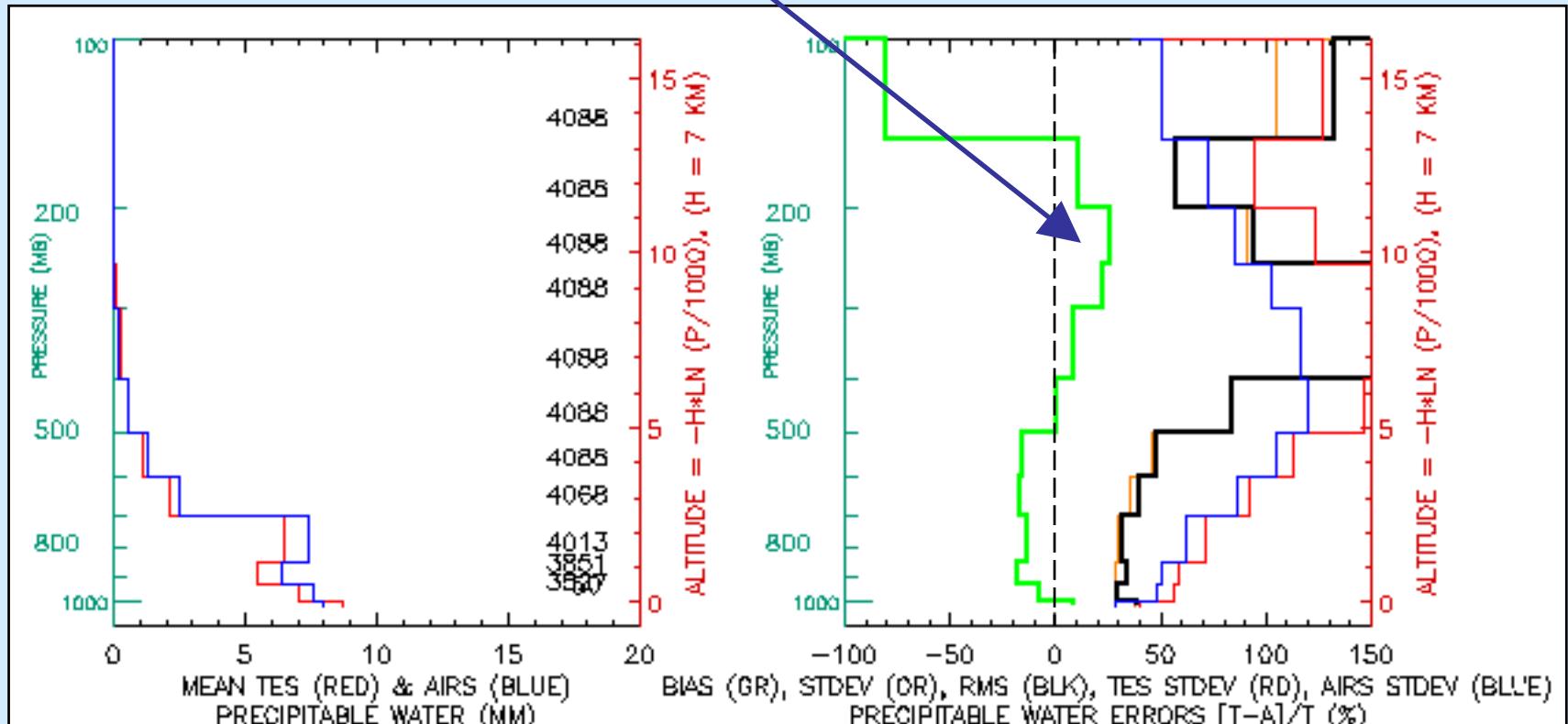
% Bias in green ([TES-AIRS]/TES),
rms differences in black

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TES vs AIRS



TES 10-25% wetter than AIRS at 150-500 hPa in UT.



Mean profiles

TES - AIRS

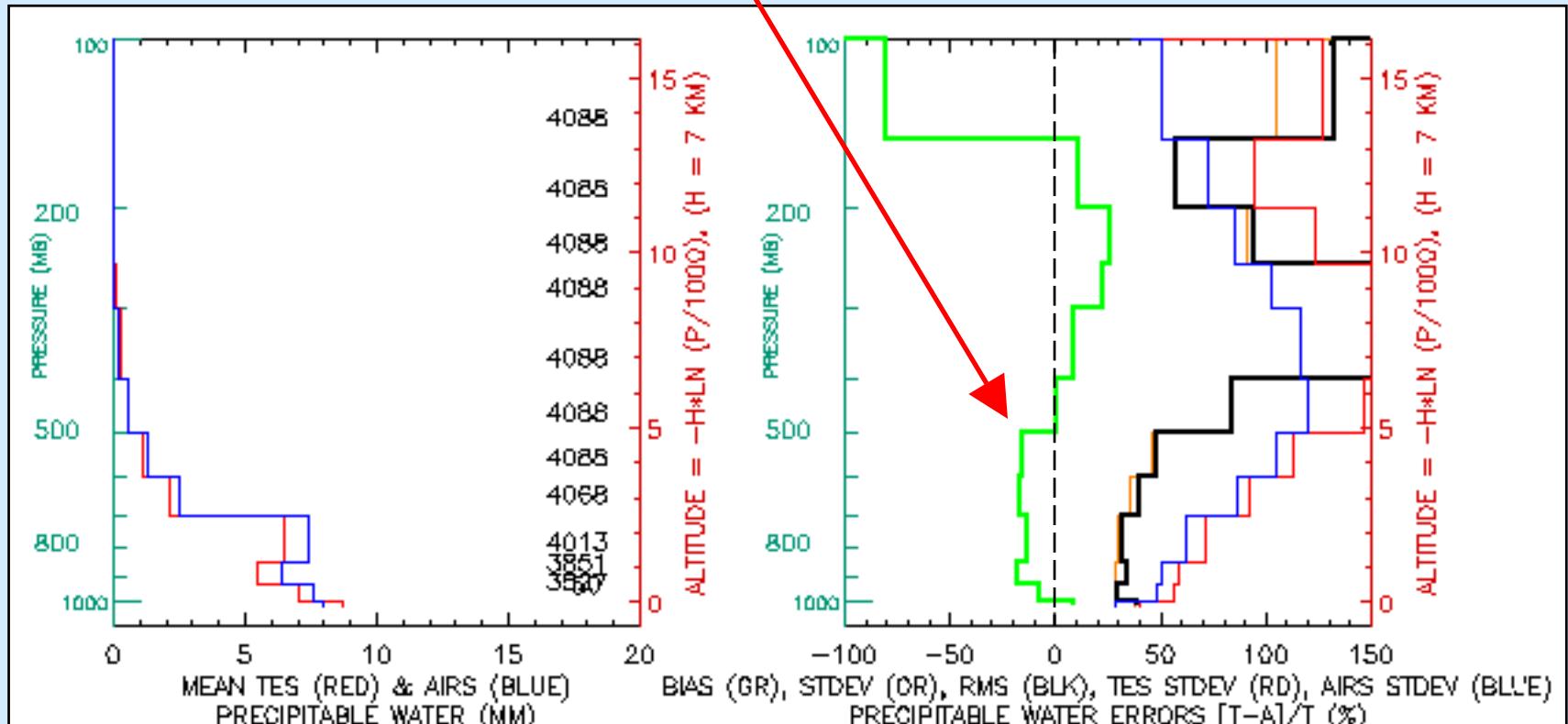


% Bias in green ($[TES-AIRS]/TES$),
rms differences in black

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TES vs AIRS

TES 15-20% drier than AIRS at 500-1000 hPa.



Mean profiles

TES - AIRS



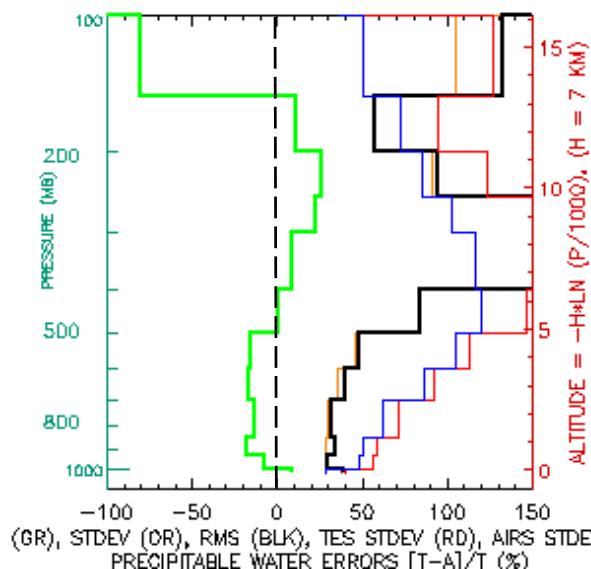
% Bias in green ($[T_{\text{ES}} - T_{\text{AIRS}}]/T_{\text{ES}}$),
rms differences in black

TES vs AIRS

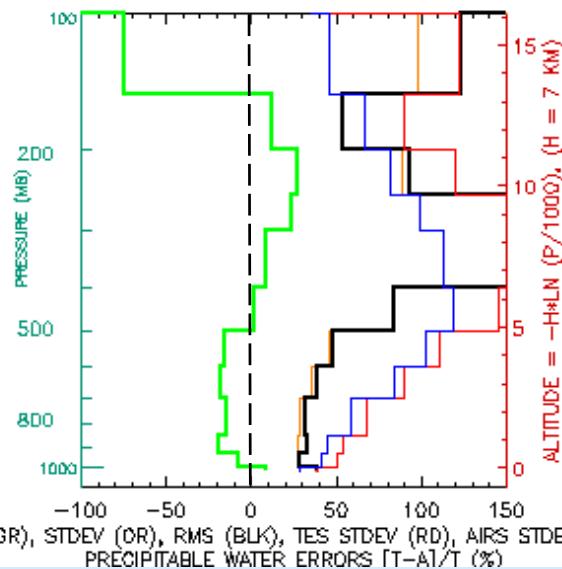


Little latitudinal dependence seen:

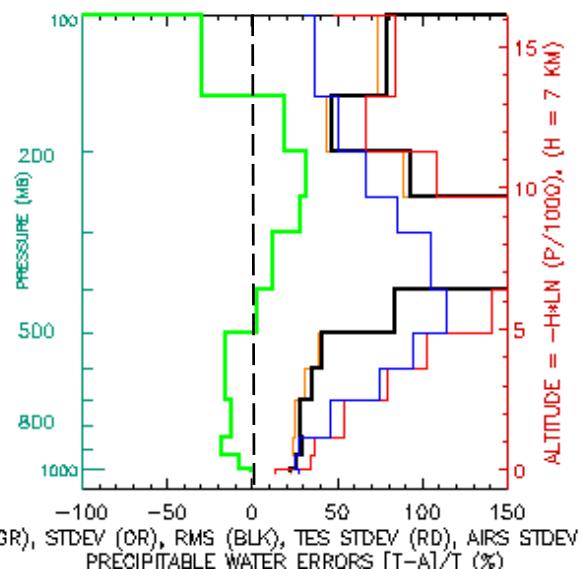
90S-90N



60S-60N



30S-30N



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TES H₂O comparisons with sondes

R. Herman, H. Worden, M. Shephard (AER)
and the TES team



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Method of comparison

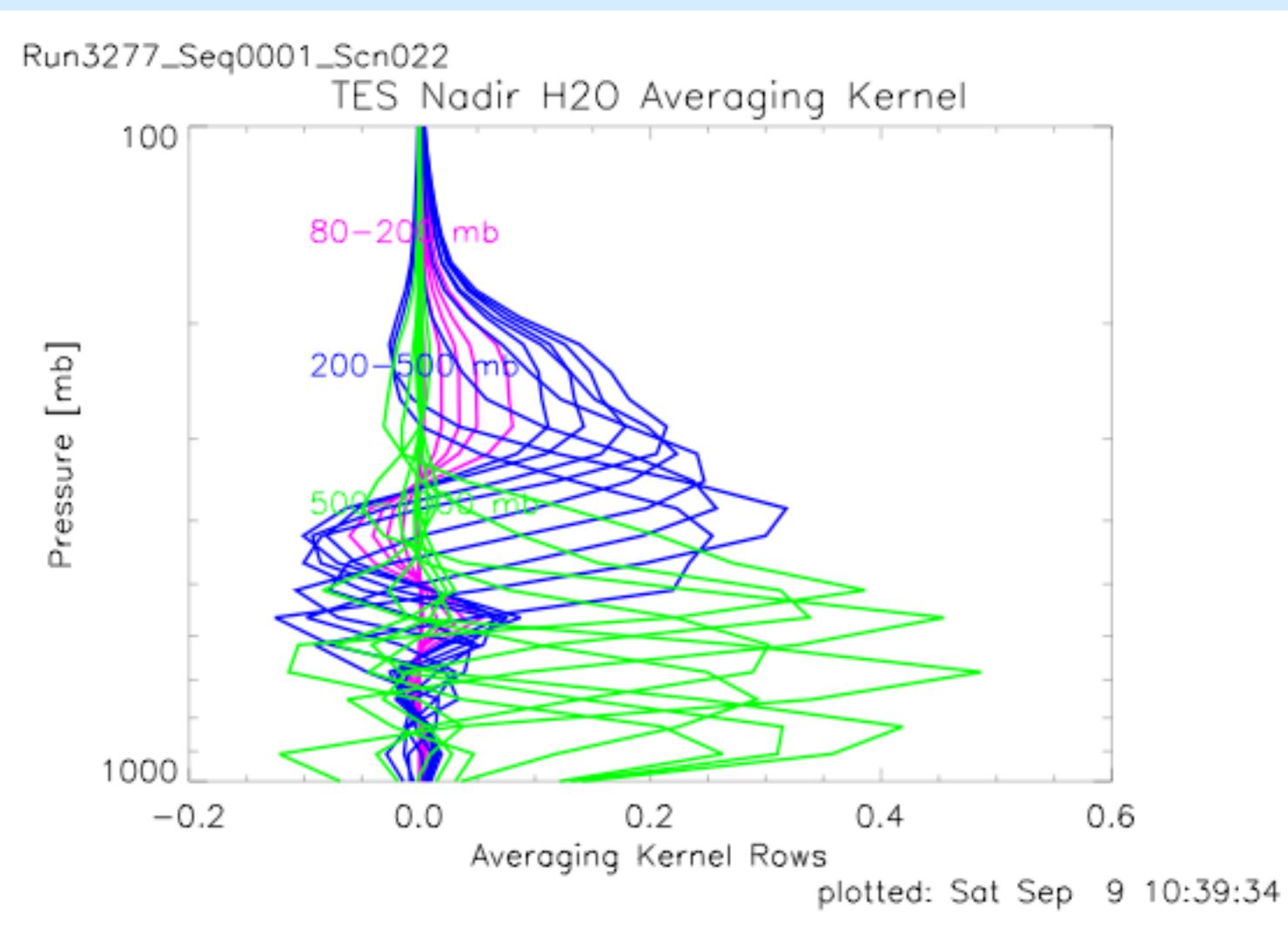
$$X_{sonde}^{TES_{AK}} = X_{apriori} + A_{TES} [X_{sonde}^{pTES} - X_{apriori}]$$

- where $X = \ln[\text{H}_2\text{O}]$.
- Interpolate the *in situ* data to the same 87 pressure levels as TES.
- Apply TES averaging kernel A_{TES} and the TES *a priori* constraint $X_{apriori}$ (from GMAO) to the *in situ* data:





TES is sensitive to tropospheric H₂O:



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Sonde comparisons demonstrate that TES improves on GMAO H₂O

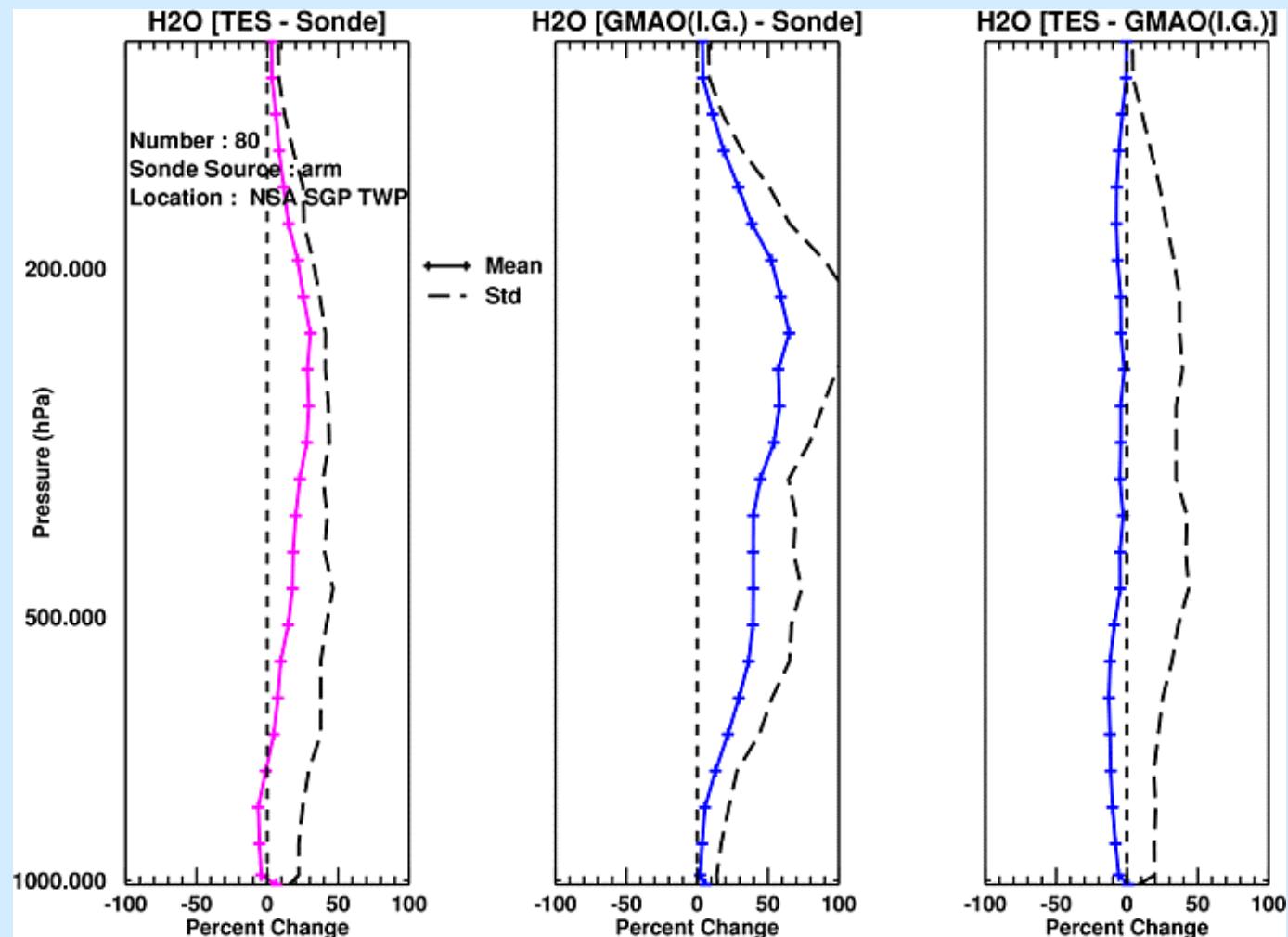
80 radiosondes (RS90 and RS92) compared with TES special obs. at DOE ARM sites.

Coincidence criteria:

within 2 hours and 250 km of the sonde launch.

TES 0-30% wetter than sondes at 100-700 hPa.

(figure provided by Mark Shephard)

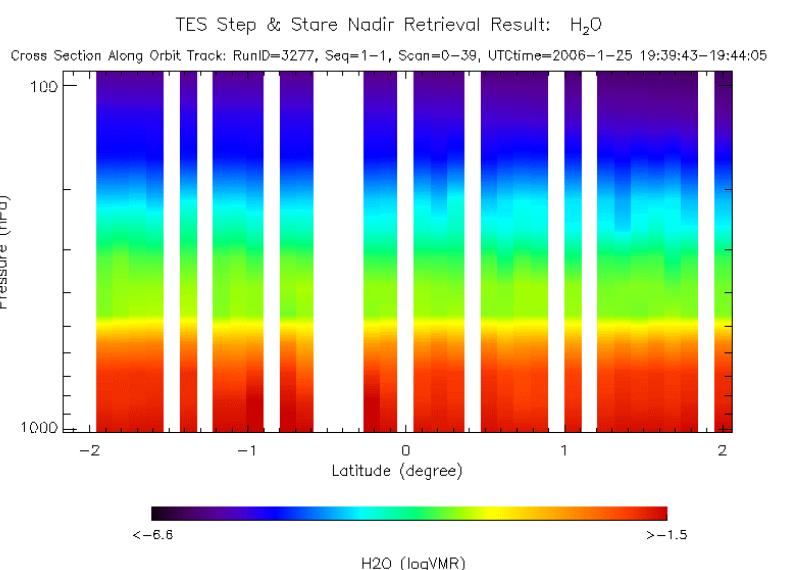




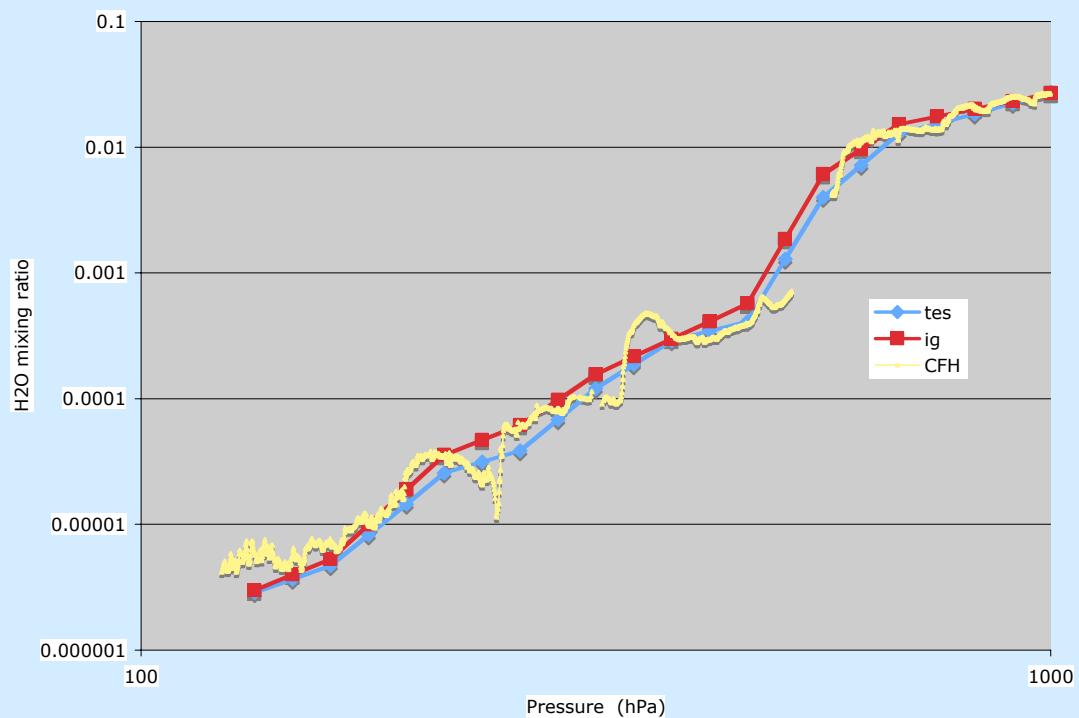
CR-AVE sondes

Case study: 25 Jan 2006 TES transect coordinated with launch of CFH/ozone/radiosonde launch from San Cristobal, Galapagos.

TES H₂O is uniform



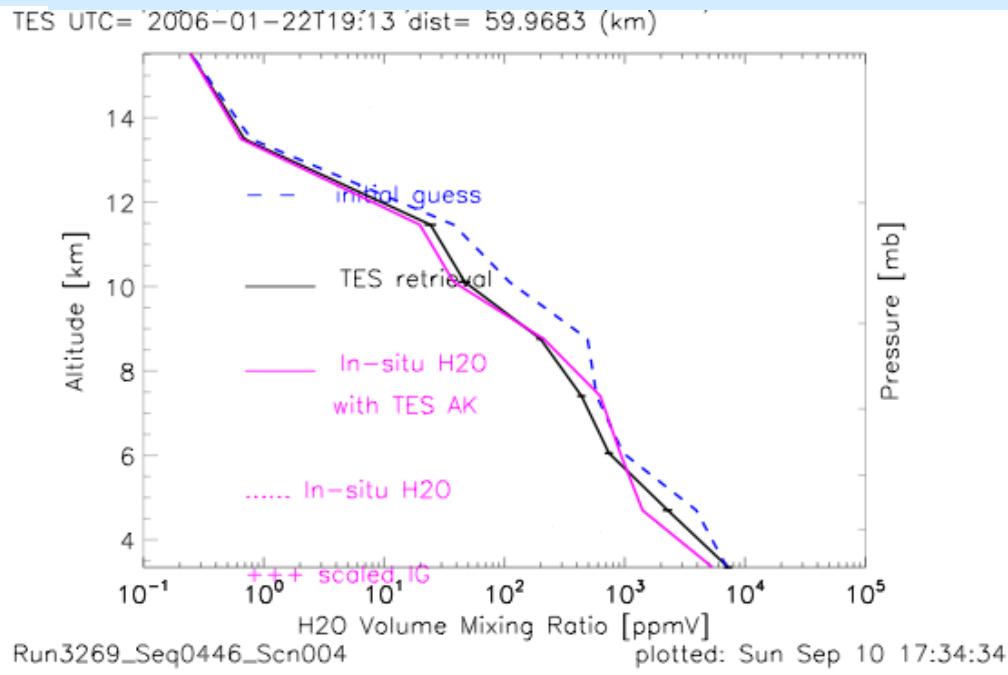
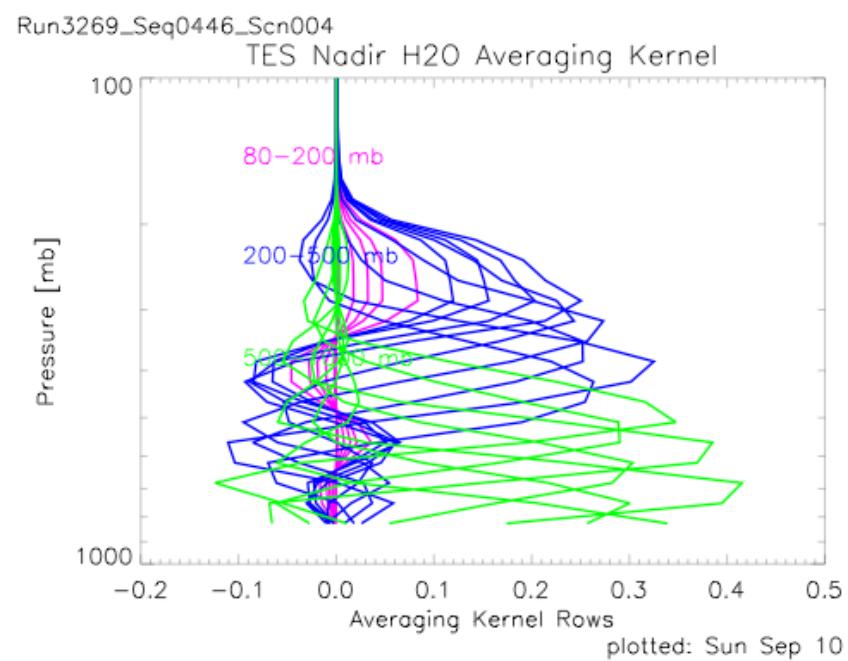
TES vs CFH H₂O



CR-AVE: aircraft ICOS, JLH, NOAA, plus ALIAS and CFH at low altitude



22 Jan 2006: TES GS 1 hr after WB-57F takeoff

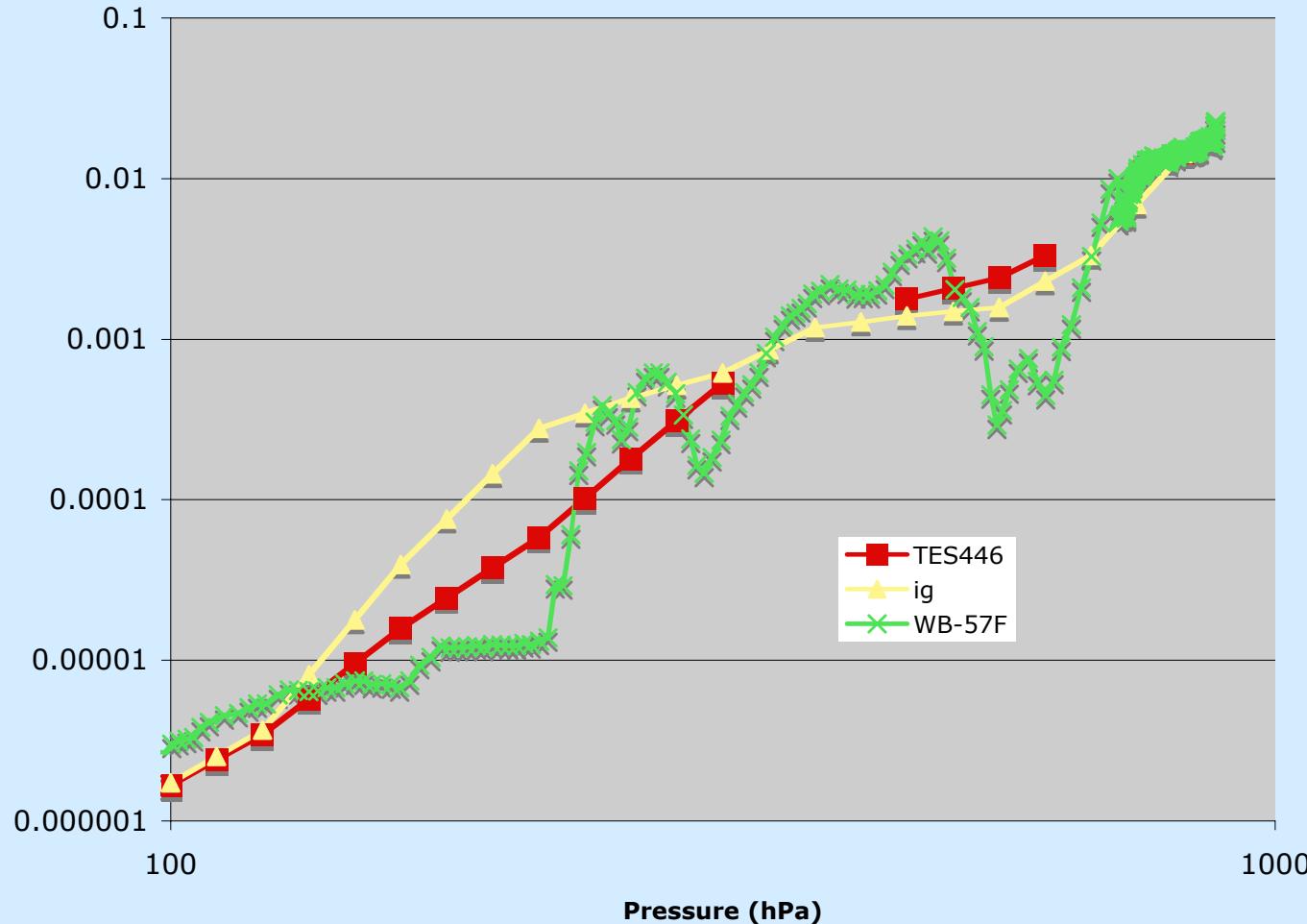


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CR-AVE aircraft: Harvard, ICOS, JLH, NOAA, plus ALIAS and CFH at low altitude



7 Feb 2006: TES GS within 1 hr of WB-57F spiral descent



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Summary

- TES v002 is 10-25% wetter than AIRS at 150-500 hPa.
- TES v002 is 15-20% drier than AIRS at 500-1000 hPa.
- TES v002 is 0-30% wetter than ARM site radiosondes at 100-700 hPa.
- The next release of TES data (v003) is coming.
- Next step: a more thorough analysis of CFH, NCEP sondes and aircraft data (including INTEX).
- Future validation needs: TES limb water vapor and high-latitude measurements poleward of 50 degrees.





Acknowledgments

We thank Ken Kelly for providing NOAA frostpoint data, Holger Voemel, Rennie Selkirk, Frank Schmidlin, and Gary Morris for sonde data.

Special thanks to Helen Worden, Annmarie Eldering, Brendan Fisher, Susan Kulawik, Michael Gunson, and Kevin Bowman for helpful suggestions.

This work was funded by the NASA Aura Program.



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